

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 16 January 2001 (16.01.01)	Applicant's or agent's file reference CWR 2 269 PC
International application No. PCT/US00/06724	Priority date (day/month/year) 15 March 1999 (15.03.99)
International filing date (day/month/year) 15 March 2000 (15.03.00)	
Applicant WELSCH, Gerhard et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 10 October 2000 (10.10.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer F. Baechler Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: RICHARD J. MINNICH
FAY, SHARPE, FAGAN, MINNICH & MCKEE, LLP
1100 SUPERIOR AVENUE
SEVENTH FLOOR
CLEVELAND OH 44114-2518

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing
(day/month/year)

10 AUG 2001

Applicant's or agent's file reference

CWR 2 269 PC

IMPORTANT NOTIFICATION

International application No.

PCT/US00/06724

International filing date (day/month/year)

15 MARCH 2000

Priority Date (day/month/year)

15 MARCH 1999

Applicant

CASE WESTERN RESERVE UNIVERSITY

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference CWR 2 269 PC	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/06724	International filing date (day/month/year) 15 MARCH 2000	Priority date (day/month/year) 15 MARCH 1999
International Patent Classification (IPC) or national classification and IPC Please See Supplemental Sheet.		
Applicant CASE WESTERN RESERVE UNIVERSITY		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>7</u> sheets.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>—</u> sheets.</p>
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input checked="" type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability</p> <p>IV <input checked="" type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input checked="" type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>

Date of submission of the demand 10 OCTOBER 2000	Date of completion of this report 02 JULY 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GABRIELLE BROUILLETTE Telephone No. (703) 308-4396 DEBORAH THOMAS <i>Dat</i> PARALEGAL SPECIALIST

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☒ the description:
pages 1-18 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____
- ☒ the claims:
pages 19-23 , as originally filed
pages NONE , as amended (together with any statement) under Article 19
pages NONE , filed with the demand
pages NONE , filed with the letter of _____
- ☒ the drawings:
pages 1-7 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____
- ☒ the sequence listing part of the description:
pages NONE , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig NONE

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/06724**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application.

☒ claims Nos. 5-14

because:

☒ the said international application, or the said claim Nos. 5-14 relate to the following subject matter which does not require international preliminary examination (*specify*).

These claims are multiple dependent claims which are dependent on multidependent claims. For instance, claim 5 is dependent on claims 2-4 but claim 4 is dependent on claims 2 and 3. Thus, the above claims could not be searched.

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*).

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68., not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☒ not complied with for the following reasons:

Please See Supplemental Sheet.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
☐ the parts relating to claims Nos. ..

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims	<u>18-22</u>	YES
	Claims	<u>1-4, 15-17 and 23-27</u>	NO
Inventive Step (IS)	Claims	<u>18-22</u>	YES
	Claims	<u>1-4, 15-17 and 23-27</u>	NO
Industrial Applicability (IA)	Claims	<u>1-27</u>	YES
	Claims	<u>NONE</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-4 lack novelty under PCT Article 33(2) as being anticipated by US 4,347,429 (WILL).

See col. 1, lines 53-65, col. 6, lines 1-24, col. 7-8 and the abstract.

Claims 15, 26-27 lack novelty under PCT Article 33(2) as being anticipated by US 5,800,639 (Yan).

See col. 5.

Claims 15, 26-27 lack novelty under PCT Article 33(2) as being anticipated by US 5,780,186 (CASEY, JR. et al).

See col. 3.

Claims 15, 26-27 lack novelty under PCT Article 33(2) as being anticipated by US 5,496,462 (ALBERT).

See col. 2 and the abstract.

Claims 15-17, 23-27 lack novelty under PCT Article 33(2) as being anticipated by JP 50-36936 (MATSUSHITA ELEC IND CO LTD).

See the abstract.

Claims 18-22 meet the criteria set out in PCT Article 33(2)-33(3), because the prior art does not teach or fairly suggest growing the sponge by heating the substrate and then contacting with a vapor which includes a halide of the sponge material in the presence of an alkali or earth alkali metal vapor and then the sponge material being deposited on the substrate in the form of dendrites.

Claims 1-27 meet the criteria set out in PCT Article 33(4) because the invention has use in electrochemical cells. Electrochemical cells provide a means to store electrochemical energy to power electrical devices such as portable phones. (Continued on Supplemental Sheet.)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 22-27 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: claims 22-27 should instead be 23-28 because there were two claims labeled claim 22.

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

CLASSIFICATION:

The International Patent Classification (IPC) and/or the National classification are as listed below:

IPC(7): H01M 4/64, 4/70, 4/30; C01B 6/02; C25C 5/02 and US Cl.: 429/233, 219, 220; 205/62, 64; 148/426

IV. LACK OF UNITY OF INVENTION:

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2, and 13.3 is not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-14, drawn to a battery.

Group II, claim(s) 15-24, drawn to a method of conducting a reaction of a surface.

Group III, claim(s) 26, drawn to a metal sponge with high specific surface area.

Group IV, claim 27, drawn to a metal sponge with a geometry.

The inventions listed as Groups I, II, III and IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical feature of Group I is an anode or cathode comprising an electrically conductive sponge material.

The technical feature of Group II is the step of growing a sponge material having a plurality of open pores which is not specifically adapted for the anode or cathode material of Group I.

The technical feature of Group III is a metal sponge with high specific surface area which is not adapted for the anode or cathode material of Group I and not made by the method of Group II.

The technical feature of Group IV is a metal sponge with a geometry of open porosity between dendrites which is not adapted for the anode or cathode material of Group I, not made by the method of Group II and not related to Group II.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

----- NEW CITATIONS -----

NONE

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 14 AUG 2001

IPEA

PCT

Applicant's or agent's file reference CWR 2 269 PC	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/06724	International filing date (day/month/year) 15 MARCH 2000	Priority date (day/month/year) 15 MARCH 1999
International Patent Classification (IPC) or national classification and IPC Please See Supplemental Sheet.		
Applicant CASE WESTERN RESERVE UNIVERSITY		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>7</u> sheets. <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of <u> </u> sheets.
3. This report contains indications relating to the following items: I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input checked="" type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability IV <input checked="" type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 10 OCTOBER 2000	Date of completion of this report 02 JULY 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GABRIELLE BROUILLETTE Telephone No. (703) 308-4396 DEBORAH THOMAS <i>Dat</i> PARALEGAL SPECIALIST

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☒ the description:
pages 1-18, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____
- ☒ the claims:
pages 19-23, as originally filed
pages NONE, as amended (together with any statement) under Article 19
pages NONE, filed with the demand
pages NONE, filed with the letter of _____
- ☒ the drawings:
pages 1-7, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____
- ☒ the sequence listing part of the description:
pages NONE, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig NONE

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application.

☒ claims Nos. 5-14

because:

☒ the said international application, or the said claim Nos. 5-14 relate to the following subject matter which does not require international preliminary examination (*specify*).

These claims are multiple dependent claims which are dependent on multidependent claims. For instance, claim 5 is dependent on claims 2-4 but claim 4 is dependent on claims 2 and 3. Thus, the above claims could not be searched.

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*).

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☒ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

Please See Supplemental Sheet.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos. _.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims	<u>18-22</u>	YES
	Claims	<u>1-4, 15-17 and 23-27</u>	NO
Inventive Step (IS)	Claims	<u>18-22</u>	YES
	Claims	<u>1-4, 15-17 and 23-27</u>	NO
Industrial Applicability (IA)	Claims	<u>1-27</u>	YES
	Claims	<u>NONE</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-4 lack novelty under PCT Article 33(2) as being anticipated by US 4,347,429 (WILL).

See col. 1, lines 53-65, col. 6, lines 1-24, col. 7-8 and the abstract.

Claims 15, 26-27 lack novelty under PCT Article 33(2) as being anticipated by US 5,800,639 (Yan).

See col. 5.

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See col. 3.

Claims 15, 26-27 lack novelty under PCT Article 33(2) as being anticipated by US 5,496,462 (ALBERT).

See col. 2 and the abstract.

Claims 15-17, 23-27 lack novelty under PCT Article 33(2) as being anticipated by JP 50-36936 (MATSUSHITA ELEC IND CO LTD).

See the abstract.

Claims 18-22 meet the criteria set out in PCT Article 33(2)-33(3), because the prior art does not teach or fairly suggest growing the sponge by heating the substrate and then contacting with a vapor which includes a halide of the sponge material in the presence of an alkali or earth alkali metal vapor and then the sponge material being deposited on the substrate in the form of dendrites.

Claims 1-27 meet the criteria set out in PCT Article 33(4) because the invention has use in electrochemical cells. Electrochemical cells provide a means to store electrochemical energy to power electrical devices such as portable phones. (Continued on Supplemental Sheet.)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 22-27 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: claims 22-27 should instead be 23-28 because there were two claims labeled claim 22.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/06724

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

CLASSIFICATION:

The International Patent Classification (IPC) and/or the National classification are as listed below:

IPC(7): H01M 4/64, 4/70, 4/30; C01B 6/02; C25C 5/02 and US Cl.: 429/233, 219, 220; 205/62, 64; 148/426

IV. LACK OF UNITY OF INVENTION:

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2, and 13.3 is not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-14, drawn to a battery.

Group II, claim(s) 15-24, drawn to a method of conducting a reaction of a surface.

Group III, claim(s) 26, drawn to a metal sponge with high specific surface area.

Group IV, claim 27, drawn to a metal sponge with a geometry.

The inventions listed as Groups I, II, III and IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical feature of Group I is an anode or cathode comprising an electrically conductive sponge material.

The technical feature of Group II is the step of growing a sponge material having a plurality of open pores which is not specifically adapted for the anode or cathode material of Group I.

The technical feature of Group III is a metal sponge with high specific surface area which is not adapted for the anode or cathode material of Group I and not made by the method of Group II.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/06724

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H01M 4/64, 4/70, 4/30; C01B 6/02; C25C 5/02

US CL :429/233, 219, 220; 205/62, 64; 148/426

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 429/233, 219, 220; 205/62, 64; 148/426

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

search terms: sponge material, battery, anode, cathode, conductive substrate, porous, porosity, dendrites

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,347,429 A (WILL) 31 August 1982, col. 1, lines 53-65, col. 6, lines 1-24, col. 7-8, abstract.	1-4
X	US 5,800,639 A (YAN) 01 September 1998, col. 5.	15, 26-27
X	US 5,780,186 A (CASEY, JR. et al) 14 July 1998, col. 3.	15, 26-27
X	US 5,496,462 A (ALBERT) 05 March 1996, col. 2, abstract.	15, 26-27
X	JP 50-36936 A(MATSUSHITA ELEC IND CO LTD) 07 April 1975, abstract.	15-17, 23-27

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

Date of mailing of the international search report

7 0 MAY 2000

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06724

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06724

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-14, drawn to a battery.

Group II, claim(s) 15-24, drawn to a method of conducting a reaction on a surface.

Group III, claim(s) 26, drawn to a metal sponge with high specific surface area.

Group IV, claim 27, drawn to metal sponge with a geometry.

The inventions listed as Groups I, II, III and IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical feature of Group I is an anode or cathode comprising an electrically conductive sponge material.

The technical feature of Group II is the step of growing a sponge material having a plurality of open pores which is not specifically adapted for the anode or cathode material of Group I.

The technical feature of Group III is a metal sponge with high specific surface area which is not adapted for the anode or cathode material of Group I and not made by the method of Group II.

The technical feature of Group IV is a metal sponge with a geometry of open porosity between dendrites which is not adapted for the anode or cathode material of Group I, not made by the method of Group II and not related to Group III.

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